June 2011

THE SPECTROGRAM

Newsletter for the Society of Telescopy, Astronomy, and Radio

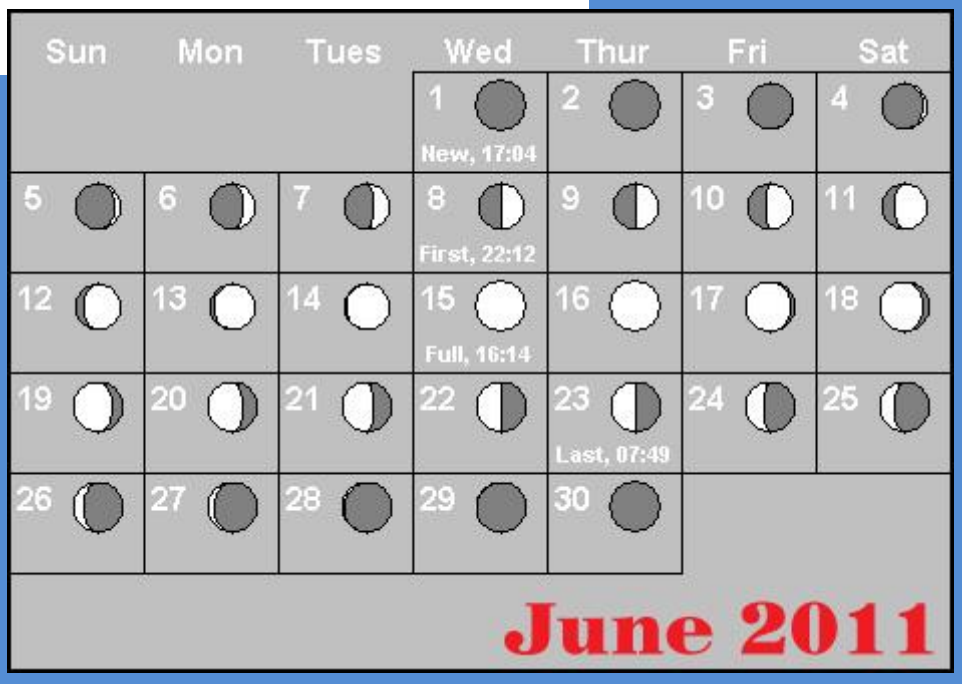
Inside this Issue:

May Meeting

The next meeting of S*T*A*R will be on Thursday, June 2nd 2011.This is our Annual Business Meeting, all members are encouraged to attend. Elections will be held for Board positions, voting will be done on agenda items, and club business will be discussed.

Calendar

- June 2nd 2011 – Annual Business Meeting
- July 29th 2011 – Tinton Falls Star Party



September Issue

Please submit articles and contributions for the next *Spectrogram* by August 27th. Please email to fowler@verizon.net.

May Meeting Minutes

The May 5t 2011 meeting of STAR Astronomy club began at 8:08pm. President Nancy McGuire chaired the meeting and began by welcoming two new people. There were 33 people in attendance.
Nancy then announced the following:

-Steve Siegel will be the club's Outeach person.

-Asked members to update their contact information (email).

-Mentioned next month will be the annual June business meeting with elections.

-We still need candidates for President and Vice president. See Frank Loso if interested

- We may need to raise dues to remain solvent.

The evening's talk was a presentation by Dr. Robert Lupton of Princeton University. His talk was titled "Astronomical Surveys from Sloan to the Large Synoptic Survey Telescope." Dr. Lupton gave the club a fascinating talk about the various telescope deep sky surveys he's been involved with including all the technical and project management details along with outlining all the data his work has compiled. His talk ended at 9:39

Ken Leagal then presented the May Sky Happenings. Ken discussed numerous conjunctions and Markarian's Chain and M51. After Ken's talk the meeting was recessed for coffee break.

At 10:12 the meeting resumed. Steve Siegel began by thanking everyone for his appointment as Outreach Chairman. He then discussed his star party experiences and gave his tips for creating a successful star party.

Nany McGuire then mentioned we may consider having every 2nd or 3rd meeting as an observing session to save on costs.

Michael Kozic then presented a short talk on double stars using a handheld star map.

The club then discussed the issue of selling the 25 inch Obsession and the current operational state of the digital setting circles. It was agreed that it should be taken to Dennis O'Leary's house and tested in preparation for sale on Astromart.

The meeting was then adjourned at approx. 10:45 p.m.

Are you a S*T*A*R Member?

Meetings are the first Thursday of each month, except July and August, at 8:00 PM at the Monmouth Museum on the Brookdale Community College campus. Meetings generally consist of lectures and discussions by members or guest speakers on a variety of interesting astronomical topics. S*T*A*R is a member of United Astronomy Clubs of New Jersey (UACNJ), the Astronomical League (AL), and the International Dark Sky Association (IDA).

Memberships: ( )Individual....$25 ( ) Family...$35

Name_____

Address_____

City_____State___Zip_____

Phone_____

Email_____

Make checks payable to: S*T*A*R Astronomy Society, Inc. and mail to P.O. Box 863, Red Bank, NJ 07701

Outreach Notes:

Tinton Falls Star Party
Friday, July 29th, 2011

Hello Everyone,
As your new Outreach Chairperson, I have been able to get the Township of Tinton Falls to host a star party for us. The public is going to be invited and the Asbury Park Press is going to put in a little advertisement about this event. In addition, they will try to get a reporter to do a story about the Club and the event. Please come-with or without telescopes. The public will be encouraged to bring binoculars and telescopes. I am hoping for a good size crowd: 50 to 100. The objective of this is to bring publicity for the Club.

Place: Sycamore Recreation Complex
Next to Atchinson School
GPS: 961 Sycamore Ave. (School)
Time: 8:30 PM

Set Up: I'll be there around 7:30.

Steve Seigel
Cell: 908-405-5037

Memorial Weekend Light Show

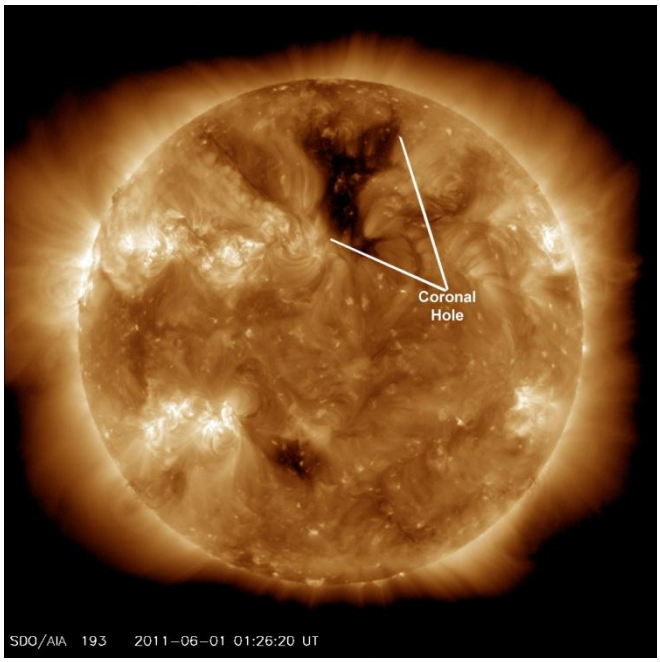
After a quiet couple of weeks our Sun is once again awakening with activity. Over the Memorial holiday weekend Earth experienced category G1 (Minor) and G2 (Moderate) geomagnetic storms on May 28-29 due to a coronal hole high-speed solar wind stream. Bright auroras at high latitudes were visible at both poles of the Earth, including Tasmania, New Zealand, Antarctica, Wisconsin and Minnesota.

In addition, R1 (Minor) radio blackouts also occurred due to solar flares on the Sun. NOAA is predicting a continuing possibility of category R1 radio blackouts through June 9, 2011.

What is a coronal hole?

The solar corona is the outer atmosphere of the sun, extending from the solar surface out into space. Coronal holes are large regions in the solar corona that appear darker and are less dense and cooler than surrounding areas. The open structure of their magnetic field allows a constant flow of high-density plasma to stream out of the holes. The high-speed solar wind is known to originate in coronal holes.

"In the Alberta prairies east of Edmonton, Canada, it looked like it was raining auroras," reports photographer Zoltan Kenwell. Credit: NASA/Zoltan Kenwell



A solar wind stream flowing from the indicated coronal hole could reach Earth on or about June 4th. Credit: SDO/AIA

There is an increase in the intensity of the solar wind effects on Earth when a coronal hole faces us. During solar minimum, coronal holes are mainly found at the Sun's polar regions. They can be located anywhere on the sun during solar maximum, which is our sun's current cycle. Coronal holes are the sources of many of the disturbances to the ionosphere (and HF communications) and to the geomagnetic field of planet Earth.

Tony Phillips/Holly Zell
NASA's Goddard Space Flight Center

Spitzer Sees Crystal Rain in Infant Star Outer Clouds

PASADENA, Calif. -- Tiny crystals of a green mineral called olivine are falling down like rain on a burgeoning star, according to observations from NASA's Spitzer Space Telescope.

This is the first time such crystals have been observed in the dusty clouds of gas that collapse around forming stars. Astronomers are still debating how the crystals got there, but the most likely culprits are jets of gas blasting away from the embryonic star.

NASA's Spitzer Space Telescope detected tiny green crystals, called olivine, thought to be raining down on a developing star. This graphic illustrates the process, beginning with a picture of the star and ending with an artist's concept of what the crystal "rain" might look like. The top picture was taken in infrared light by NASA's Spitzer Space Telescope. An arrow points to the embryonic star, called HOPS-68. The middle panel illustrates how the olivine crystals are suspected to have been transported into the outer cloud around the developing star, or protostar. Jets shooting away from the protostar, where temperatures are hot enough to cook the crystals, are thought to have transported them to the outer cloud, where temperatures are much colder. Astronomers say the crystals are raining back down onto the swirling disk of planet-forming dust circling the star, as depicted in the final panel. Image credit: NASA/JPL-Caltech/University of Toledo

"You need temperatures as hot as lava to make these crystals," said Tom Megeath of the University of Toledo in Ohio. He is the principal investigator of the research and the second author of a new study appearing in Astrophysical Journal Letters. "We propose that the crystals were cooked up near the surface of the forming star, then carried up into the surrounding cloud where temperatures are much colder, and ultimately fell down again like glitter."

Spitzer's infrared detectors spotted the crystal rain around a distant, sun-like embryonic star, or protostar, referred to as HOPS-68, in the constellation Orion.

This image from NASA's Spitzer Space Telescope shows what lies near the sword of the constellation Orion -- an active stellar nursery containing thousands of young stars and developing protostars. Many will turn out like our sun. Some are even more massive. These massive stars light up the Orion nebula, which is seen here as the bright region near the center of the image. To the north of the Orion nebula is a dark filamentary cloud of cold dust and gas, over 5 light-years in length, containing ruby red protostars that jewel the hilt of Orion's sword. These are the newest generation of stars in this stellar nursery, and include the protostar HOPS 68, where Spitzer spotted tiny green crystals in a surrounding cloud of gas. Image credit: NASA/JPL-Caltech/University of Toledo

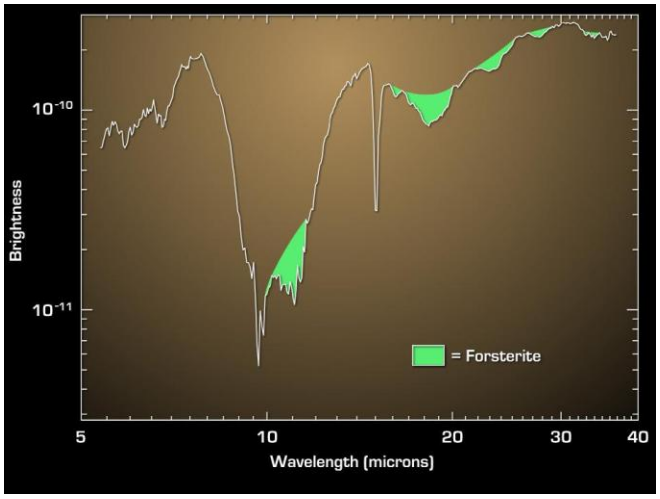
The crystals are in the form of forsterite. They belong to the olivine family of silicate minerals and can be found everywhere from a periodot gemstone to the green sand beaches of Hawaii to remote galaxies. NASA's Stardust and Deep Impact missions both detected the crystals in their close-up studies of comets.

"If you could somehow transport yourself inside this protostar's collapsing gas cloud, it would be very dark," said Charles Poteet, lead author of the new study, also from the University of Toledo. "But the tiny crystals might catch whatever light is present, resulting in a green sparkle against a black, dusty backdrop."

Forsterite crystals were spotted before in the swirling, planet-forming disks that surround young stars. The discovery of the crystals in the outer collapsing cloud of a proto-star is surprising because of the cloud's colder temperatures, about minus 280 degrees Fahrenheit (minus 170 degrees Celsius). This led the team of astronomers to speculate the jets may in fact be transporting the cooked-up crystals to the chilly outer cloud.

The findings might also explain why comets, which form in the frigid outskirts of our solar system, contain the same

type of crystals. Comets are born in regions where water is frozen, much colder than the searing temperatures needed to form the crystals, approximately 1,300 degrees Fahrenheit (700 degrees Celsius). The leading theory on how comets acquired the crystals is that materials in our young solar system mingled together in a planet-forming disk. In this scenario, materials that formed near the sun, such as the crystals, eventually migrated out to the outer, cooler regions of the solar system.



Using NASA's Spitzer Space Telescope, astronomers have, for the first time, found signatures of silicate crystals around a newly forming protostar in the constellation of Orion. The crystals are from the olivine silicate minerals known as forsterite, and are similar to those found on the green sand beaches of Hawaii. The data in the graph were taken by Spitzer's infrared spectrograph, which sorts infrared light relative to its color, or wavelength. The characteristic spectral signatures of the crystals are shaded in green. The formation of forsterite crystals requires relatively high temperatures near 1,300 degrees Fahrenheit (700 degrees Celsius). The crystals were not expected to beseen in the cold environment of a newly forming star (minus 280 degrees Fahrenheit or minus 130 degrees Celsius). Astronomers believe that these crystals were created near the protostar and carried up to a cold, collapsing cloud of gas and dust by jets of gas. The crystals are expected to eventually rain back down onto the protostar's planet-forming disk, possibly to be used in the formation of comets. Image credit: NASA/JPL-Caltech/University of Toledo

Poteet and his colleagues say this scenario could still be true but speculate that jets might have lifted crystals into the collapsing cloud of gas surrounding our early sun before raining onto the outer regions of our forming solar system. Eventually, the crystals would have been frozen into comets. The Herschel Space Observatory, a European Space Agency-led mission with important NASA contributions, also participated in the study by characterizing the forming star.

"Infrared telescopes such as Spitzer and now Herschel are providing an exciting picture of how all the ingredients of the cosmic stew that makes planetary systems are blended together," said Bill Danchi, senior astrophysicist and program scientist at NASA Headquarters in Washington.

Other authors include Dan M. Watson and Ian S. Remming of the University of Rochester, NY; Nuria Calvet, Melissa K. McClure, Lee Hartmann and John J. Tobin of the University of Michigan, Ann Arbor, Mich.; Benjamin A. Sargent and James Muzerolle of the Space Telescope Science Institute, Baltimore, Md.; William J. Fischer and Jon E. Bjorkman of the University of Toledo, Ohio; Elise Furlan of NASA's Jet Propulsion Laboratory, Pasadena, Calif.; Lori E. Allen of National Optical Astronomy Observatory, Tucson, Ariz.; and Babar Ali of NASA's Herschel Science Center, California Institute of Technology, Pasadena.

The Spitzer observations were made before it used up its liquid coolant in May 2009 and began its warm mission.

NASA's Jet Propulsion Laboratory in Pasadena, Calif., manages the Spitzer Space Telescope mission for the agency's Science Mission Directorate in Washington. Science operations are conducted at the Spitzer Science Center at the California Institute of Technology in Pasadena. Caltech manages JPL for NASA.

For more information about Spitzer, visit http://www.nasa.gov/spitzerand http://spitzer.caltech.edu/.

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Teasing Apart Galaxy Collisions

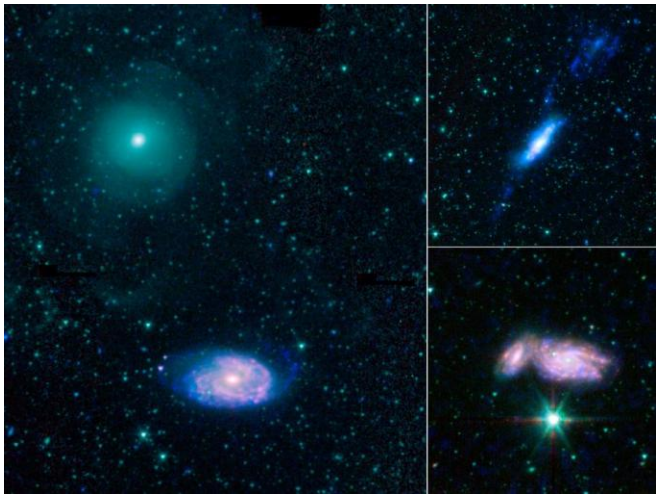
A few billion years from now, our Milky Way galaxy will collide with the Andromeda galaxy. This will mark a moment of both destruction and creation. The galaxies will lose their separate identities as they merge into one. At the same time, cosmic clouds of gas and dust will smash together, triggering the birth of new stars.

To better understand collisions like these, astronomers have assembled an atlas of several galactic "train wrecks."

The new images combine observations from NASA's Spitzer Space Telescope, which observes infrared light, and NASA's Galaxy Evolution Explorer spacecraft, which observes ultraviolet light. By analyzing information from different parts of the light spectrum, scientists can learn much more about the collision process than from a single wavelength alone.

"We're working with the theorists to give our understanding a reality check," said the lead author of a paper on the

results, Lauranne Lanz of the Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass. “Our understanding will really be tested in a few billion years, when the Milky Way experiences its own collision.”



This montage shows three examples of colliding galaxies from a new photo atlas of galactic "train wrecks." The new images combine observations from NASA's Spitzer Space Telescope, which observes infrared light, and NASA's Galaxy Evolution Explorer (GALEX) spacecraft, which observes ultraviolet light. By analyzing information from different parts of the light spectrum, scientists can learn much more than from a single wavelength alone, because different components of a galaxy are highlighted. The panel at far left shows NGC 470 (top) and NGC 474 (bottom); at top right are NGC 3448 and UGC 6016; at bottom right are NGC 935 and IC 1801. In this representative-color image, far-ultraviolet light from GALEX is blue, 3.6-micron light from Spitzer is cyan, 4.5-micron light from Spitzer is green, and red shows light at 5.8 and 8 microns from Spitzer. Image credit: NASA/JPL-Caltech/Harvard-Smithsonian CfA

Read the full story from the Harvard-Smithsonian Center for Astrophysics at http://www.cfa.harvard.edu/news/2011/pr201117.html.

NASA's Jet Propulsion Laboratory, Pasadena, Calif., manages the Spitzer Space Telescope mission for NASA's Science Mission Directorate, Washington. Science operations are conducted at the Spitzer Science Center at the California Institute of Technology in Pasadena. Caltech manages JPL for NASA. More information is online at http://spitzer.caltech.edu/ and http://www.nasa.gov/spitzer .

Caltech leads the Galaxy Evolution Explorer mission and is responsible for science operations and data analysis. JPL manages the mission and built the science instrument. The mission was developed under NASA's Explorers Program managed by the Goddard Space Flight Center, Greenbelt, Md. Researchers sponsored by Yonsei University in South Korea and the Centre National d'Etudes Spatiales (CNES) in France collaborated on this mission.

More information is online at http://www.nasa.gov/galex/ and http://www.galex.caltech.edu .

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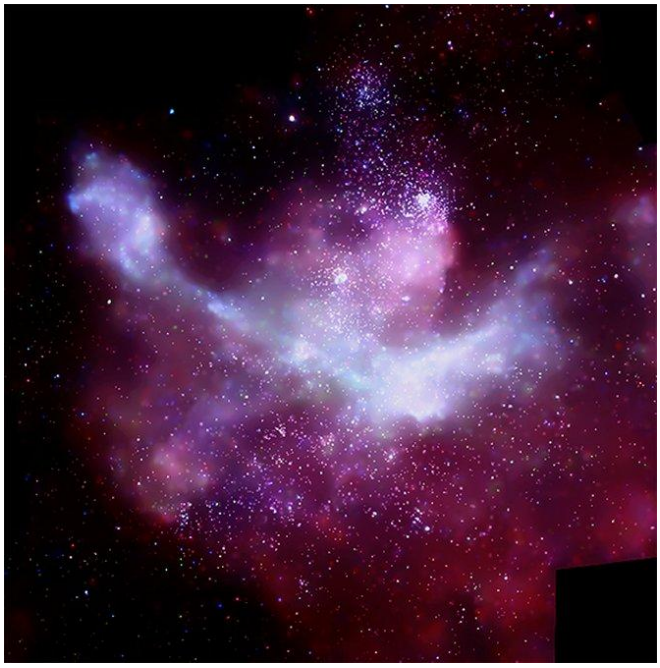
Nearby Supernova Factory is Ramping Up

A local supernova factory has recently started production, according to a wealth of new data from NASA's Chandra X-ray Observatory on the Carina Nebula. This discovery may help astronomers better understand how some of the Galaxy's heaviest and youngest stars race through their lives and release newly-forged elements into their surroundings.



Carina Nebula, a star-forming region in the Milky Way. (NASA/CXC/Penn State/L. Townsley et al.)

Located in the Sagittarius-Carina arm of the Milky Way a mere 7,500 light years from Earth, the Carina Nebula has long been a favorite target for astronomers using telescopes tuned to a wide range of wavelengths. Chandra's extraordinarily sharp X-ray vision has detected over 14,000 stars in this region, revealed a diffuse X-ray glow, and provided strong evidence that supernovas have already occurred in this massive complex of young stars.

"The Carina Nebula is one of the best places we know to study how young massive stars live and die," said Leisa Townsley of Penn State University, who led the large Chandra campaign to observe Carina. "Now, we have a

compelling case that a supernova show in Carina has already begun."

One important piece of evidence is an observed deficit of bright X-ray sources in Trumpler 15, one of ten star clusters in the Carina complex.

"This suggests that some of the massive stars in Trumpler 15 have already been destroyed in supernova explosions," said Junfeng Wang of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass, first author of a paper on this cluster. "These stars were likely between 20 and 40 times the mass of the Sun and would have exploded in the last few million years, which is very recent in cosmic terms."

The new Chandra survey also revealed the presence of six possible neutron stars, the dense cores often left behind after stars explode in supernovas, when previous observations had only detected one neutron star in Carina.

Neutron stars in star-forming regions are very difficult to spot because they are characterized by low-energy X-rays, which are easily absorbed by dust and gas. Therefore, the detected neutron stars probably represent only a small fraction of the complete population, providing strong evidence that the supernova activity is ramping up.

The diffuse emission observed by Chandra also supports the idea that supernovas have already erupted in Carina. Some of the diffuse X-ray emission almost certainly comes from the winds of massive stars, but some may also come from the remains of supernova explosions.

Another outcome from the new Chandra survey of Carina, which represents about 300 hours of observing time spread over 9 months, is a new population of young massive stars. These stars had not been seen before because of obscuration, or because they are located outside well-studied clusters.

"We may have doubled the number of known young, massive stars in Carina by looking this long with Chandra," said Matthew Povich of Penn State, first author of a paper on this new population. "Nearly all of these stars are destined to self-destruct in supernova explosions."

Undoubtedly the most famous constituent of the Carina Nebula is Eta Carinae, a massive, unstable star that may be on the verge of exploding as a supernova. When it does explode, it will likely be a spectacular – yet still safe - light in the Earth's sky. These latest results suggest Eta Carinae is not alone in its volatility.

"Supernovas aren't just eye-catching events, but they release newly-forged elements like carbon, oxygen and iron into their surroundings so they can join in the formation of new objects, like stars and planets," said Townsley.

The Chandra survey has a large field of 1.4 square degrees, made of a mosaic of 22 individual Chandra pointings. A great deal of multi-wavelength data has been used in this campaign including infrared observations from the Spitzer Space Telescope and the Very Large Telescope (VLT). The Carina results were presented at the 218th American Astronomical Society meeting in Boston, and also appear in a special Astrophysical Journal Supplement issue of 16 papers devoted to the new Chandra observations of Carina.

NASA's Marshall Space Flight Center in Huntsville, Ala., manages the Chandra program for NASA's Science Mission Directorate in Washington. The Smithsonian Astrophysical Observatory controls Chandra's science and flight operations from Cambridge, Mass.

More information, including images and other multimedia, can be found at: http://chandra.si.edu

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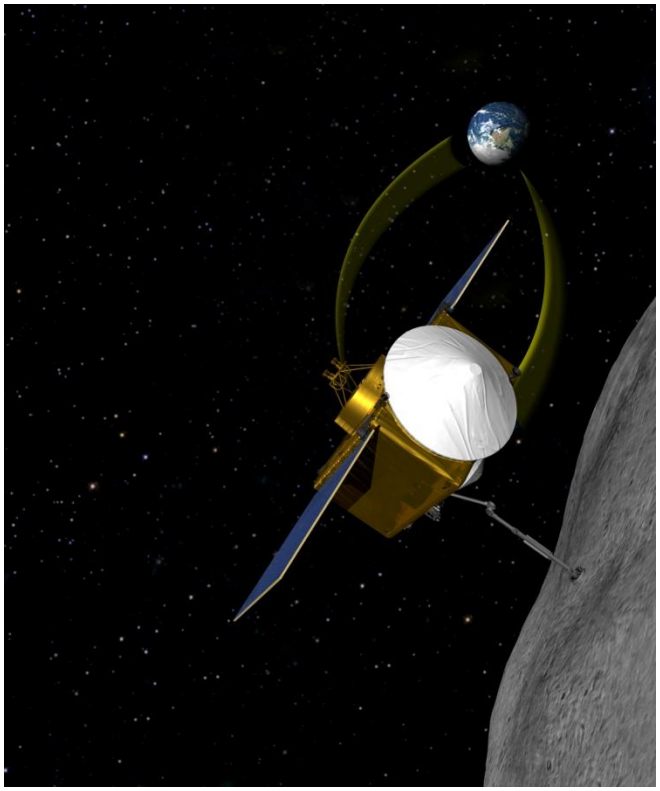
NASA to Launch New Science Mission to Asteroid in 2016

NASA will launch a spacecraft to an asteroid in 2016 and use a robotic arm to pluck samples that could better explain our solar system's formation and how life began. The mission, called Origins-Spectral Interpretation-Resource Identification-Security-Regolith Explorer, or OSIRIS-REx, will be the first U.S. mission to carry samples from an asteroid back to Earth.

"This is a critical step in meeting the objectives outlined by President Obama to extend our reach beyond low-Earth orbit and explore into deep space," said NASA Administrator Charlie Bolden. "It's robotic missions like these that will pave the way for future human space missions to an asteroid and other deep space destinations."
NASA selected OSIRIS-REx after reviewing three concept study reports for new scientific missions, which also included a sample return mission from the far side of the Moon and a mission to the surface of Venus.

Asteroids are leftovers formed from the cloud of gas and dust -- the solar nebula -- that collapsed to form our sun and the planets about 4.5 billion years ago. As such, they contain the original material from the solar nebula, which can tell us about the conditions of our solar system's birth.



Conceptual image of OSIRIS-REx.
Credit: NASA/Goddard/University of Arizona

After traveling four years, OSIRIS-REx will approach the primitive, near Earth asteroid designated 1999 RQ36 in 2020. Once within three miles of the asteroid, the spacecraft will begin six months of comprehensive surface mapping. The science team then will pick a location from where the spacecraft's arm will take a sample. The spacecraft gradually will move closer to the site, and the arm will extend to collect more than two ounces of material for return to Earth in 2023. The mission, excluding the launch vehicle, is expected to cost approximately $800 million.

The sample will be stored in a capsule that will land at Utah's Test and Training Range in 2023. The capsule's design will be similar to that used by NASA's Stardust spacecraft, which returned the world's first comet particles from comet Wild 2 in 2006. The OSIRIS-REx sample capsule will be taken to NASA's Johnson Space Center in Houston. The material will be removed and delivered to a dedicated research facility following stringent planetary protection protocol. Precise analysis will be performed that cannot be duplicated by spacecraft-based instruments.

RQ36 is approximately 1,900 feet in diameter or roughly the size of five football fields. The asteroid, little altered over time, is likely to represent a snapshot of our solar system's infancy. The asteroid also is likely rich in carbon, a key element in the organic molecules necessary for life. Organic molecules have been found in meteorite and comet samples, indicating some of life's ingredients can be created in space. Scientists want to see if they also are present on RQ36.

"This asteroid is a time capsule from the birth of our solar system and ushers in a new era of planetary exploration," said Jim Green, director, NASA's Planetary Science Division in Washington. "The knowledge from the mission also will help us to develop methods to better track the orbits of asteroids."

The mission will accurately measure the "Yarkovsky effect" for the first time. The effect is a small push caused by the sun on an asteroid, as it absorbs sunlight and re-emits that energy as heat. The small push adds up over time, but it is uneven due to an asteroid's shape, wobble, surface composition and rotation. For scientists to predict an Earth-approaching asteroid's path, they must understand how the effect will change its orbit. OSIRIS-REx will help refine RQ36's orbit to ascertain its trajectory and devise future strategies to mitigate possible Earth impacts from celestial objects.

Michael Drake of the University of Arizona in Tucson is the mission's principal investigator. NASA's Goddard Space Flight Center in Greenbelt, Md., will provide overall mission management, systems engineering, and safety and mission assurance. Lockheed Martin Space Systems in Denver will build the spacecraft. The OSIRIS-REx payload includes instruments from the University of Arizona, Goddard, Arizona State University in Tempe and the Canadian Space Agency. NASA’s Ames Research Center at Moffett Field, Calif., the Langley Research Center in Hampton Va., and the Jet Propulsion Laboratory in Pasadena, Calif., also are involved. The science team is composed of numerous researchers from universities, private and government agencies.

This is the third mission in NASA's New Frontiers Program. The first, New Horizons, was launched in 2006. It will fly by the Pluto-Charon system in July 2015, then target another Kuiper Belt object for study. The second mission, Juno, will launch in August to become the first spacecraft to orbit Jupiter from pole to pole and study the giant planet's atmosphere and interior. NASA's Marshall Space Flight Center in Huntsville, Ala., manages New Frontiers for the agency's Science Mission Directorate in Washington.

NASA's Hubble Finds Rare 'Blue Straggler' Stars in Milky Way's Hub

NASA's Hubble Space Telescope has found a rare class of oddball stars called blue stragglers in the hub of our Milky Way, the first detected within our galaxy's bulge.

Blue stragglers are so named because they seemingly lag behind in the aging process, appearing younger than the population from which they formed. While they have been detected in many distant star clusters, and among nearby stars, they never have been seen inside the core of our galaxy.

The Hubble Telescope captures blue straggler stars in the Milky Way bulge Credit: NASA, ESA, W. Clarkson (Indiana University and UCLA), and K. Sahu (STScI)

It is not clear how blue stragglers form. A common theory is that they emerge from binary pairs. As the more massive star evolves and expands, the smaller star gains material from its companion. This stirs up hydrogen fuel and causes the growing star to undergo nuclear fusion at a faster rate. It burns hotter and bluer, like a massive young star.
The findings support the idea that the Milky Way's central bulge stopped making stars billions of years ago. It now is home to aging sun-like stars and cooler red dwarfs. Giant blue stars that once lived there have long since exploded as supernovae.

The results have been accepted for publication in an upcoming issue of The Astrophysical Journal. Lead author Will Clarkson of Indiana University in Bloomington, will discuss them today at the American Astronomical Society meeting in Boston.

"Although the Milky Way bulge is by far the closest galaxy bulge, several key aspects of its formation and subsequent evolution remain poorly understood," Clarkson said. "Many details of its star-formation history remain controversial. The extent of the blue straggler population detected provides two new constraints for models of the star-formation history of the bulge."

The discovery followed a seven-day survey in 2006 called the Sagittarius Window Eclipsing Extrasolar Planet Search (SWEEPS). Hubble peered at 180,000 stars in the crowded central bulge of our galaxy, 26,000 light-years away. The survey was intended to find hot Jupiter-class planets that orbit very close to their stars. In doing so, the SWEEPS team also uncovered 42 oddball blue stars with brightness and temperatures typical for stars much younger than ordinary bulge stars.

The observations clearly indicate that if there is a young star population in the bulge, it is very small. It was not detected in the SWEEPS program. Blue stragglers long have been suspected to be living in the bulge, but had not been observed because younger stars in the disk of our galaxy lie along the line-of-sight to the core, confusing and contaminating the view.

Astronomers used Hubble to distinguish the motion of the core population from foreground stars in the Milky Way. Bulge stars orbit the galactic center at a different speed than foreground stars. Plotting their motion required returning to the SWEEPS target region with Hubble two years after the first observations were made. The blue stragglers were identified as moving along with the other stars in the bulge.

"The size of the field of view on the sky is roughly that of the thickness of a human fingernail held at arm's length, and within this region, Hubble sees about a quarter million stars toward the bulge," Clarkson said. "Only the superb image quality and stability of Hubble allowed us to make this measurement in such a crowded field."

From the 42 candidate blue stragglers, the investigators estimate 18 to 37 are likely genuine. The remainder could be a mix of foreground objects and, at most, a small population of genuinely young bulge stars.

"The SWEEPS program was designed to detect transiting planets through small light variations" said Kailash Sahu, the principal investigator of the SWEEPS program. "Therefore the program could easily detect the variability of binary pairs, which was crucial in confirming these are indeed blue stragglers."

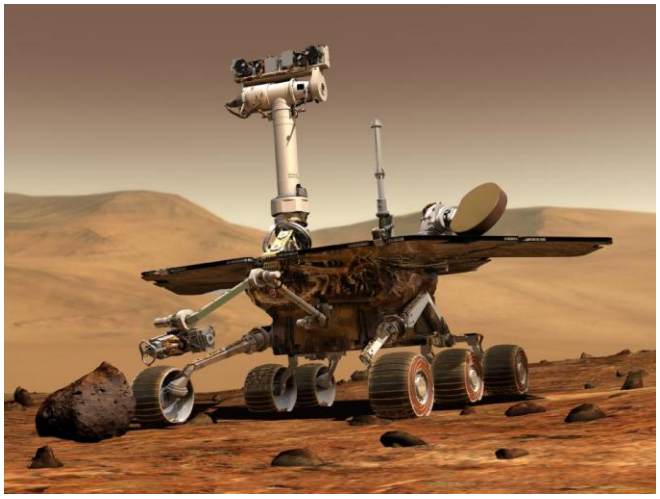
Hubble is a project of international cooperation between NASA and the European Space Agency. NASA's Goddard Space Flight Center in Greenbelt, Md., manages the telescope. The Space Telescope Science Institute (STScI) conducts Hubble science operations. STScI is operated for NASA by the Association of Universities for Research in Astronomy in Washington. For images and more information about the findings, visit:

http://www.nasa.gov/hubble
and
http://hubblesite.org/news/2011/16
Cheryl Gundy, STSCI

NASA's Spirit Rover Completes Mission on Mars

NASA has ended operational planning activities for the Mars rover Spirit and transitioned the Mars Exploration Rover Project to a single-rover operation focused on Spirit's still-active twin, Opportunity.

This marks the completion of one of the most successful missions of interplanetary exploration ever launched.



An artist's concept portrays a NASA Mars Exploration Rover on the surface of Mars. Two rovers have been built for 2003 launches and January 2004 arrival at two sites on Mars. Each rover has the mobility and toolkit to function as a robotic geologist. Image credit: NASA/JPL/Cornell University

Spirit last communicated on March 22, 2010, as Martian winter approached and the rover's solar-energy supply declined. The rover operated for more than six years after landing in January 2004 for what was planned as a three-month mission. NASA checked frequently in recent months for possible reawakening of Spirit as solar energy available to the rover increased during Martian spring. A series of additional re-contact attempts ended today, designed for various possible combinations of recoverable conditions.

"Our job was to wear these rovers out exploring, to leave no unutilized capability on the surface of Mars, and for Spirit, we have done that," said Mars Exploration Rover Project Manager John Callas of NASA's Jet Propulsion Laboratory, Pasadena, Calif.

Spirit drove 4.8 miles (7.73 kilometers), more than 12 times the goal set for the mission. The drives crossed a plain to reach a distant range of hills that appeared as mere bumps on the horizon from the landing site; climbed slopes up to 30 degrees as Spirit became the first robot to summit a hill on another planet; and covered more than half a mile (nearly a kilometer) after Spirit's right-front wheel became immobile in 2006. The rover returned more than 124,000 images. It ground the surfaces off 15 rock targets and scoured 92 targets with a brush to prepare the targets for inspection with spectrometers and a microscopic imager.
"What's really important is not only how long Spirit worked or how far Spirit drove, but also how much exploration and scientific discovery Spirit accomplished," Callas said.

One major finding came, ironically, from dragging the inoperable right-front wheel as the rover was driving backwards in 2007. That wheel plowed up bright white soil. Spirit's Alpha Particle X-ray Spectrometer and Miniature Thermal Emission Spectrometer revealed that the bright material was nearly pure silica.

"Spirit's unexpected discovery of concentrated silica deposits was one of the most important findings by either rover," said Steve Squyres of Cornell University, Ithaca, N.Y., principal investigator for Spirit and Opportunity. "It showed that there were once hot springs or steam vents at the Spirit site, which could have provided favorable conditions for microbial life."

The silica-rich soil neighbors a low plateau called Home Plate, which was Spirit's main destination after the historic climb up Husband Hill. "What Spirit showed us at Home Plate was that early Mars could be a violent place, with water and hot rock interacting to make what must have been spectacular volcanic explosions. It was a dramatically different world than the cold, dry Mars of today," said Squyres.

The trove of data from Spirit could still yield future science revelations. Years of analysis of some 2005 observations by the rover's Alpha Particle X-ray Spectrometer, Miniature Thermal Emission Spectrometer and Moessbauer Spectrometer produced a report last year that an outcrop on Husband Hill bears a high concentration of carbonate. This is evidence of a wet, non-acidic ancient environment that may have been favorable for microbial life.

"What's most remarkable to me about Spirit's mission is just how extensive her accomplishments became," said Squyres. "What we initially conceived as a fairly simple geologic experiment on Mars ultimately turned into humanity's first real overland expedition across another planet. Spirit explored just as we would have, seeing a distant hill, climbing it, and showing us the vista from the summit. And she did it in a way that allowed everyone on Earth to be part of the adventure."

JPL, a division of the California Institute of Technology in Pasadena, manages the Mars Exploration Rovers Opportunity and Spirit for the NASA Science Mission Directorate, Washington. For more about the rovers, see: http://www.nasa.gov/rovers or http://marsrovers.jpl.nasa.gov/home/index.html.

Guy Webster Jet Propulsion Laboratory, Pasadena, Calif.

NASA's WISE Mission Offers a Taste of Galaxies to Come

PASADENA, Calif. -- An assorted mix of colorful galaxies is being released today by NASA's Wide-field Infrared Survey Explorer mission, or WISE. The nine galaxies are a taste of what's to come. The mission plans to release similar images for the 1,000 largest galaxies that appear in our sky, and possibly more.

"Galaxies come in all sorts of delicious flavors," said Tom Jarrett, a WISE team member at the Infrared Processing and Analysis Center, California Institute of Technology, in Pasadena, who studies our Milky Way's neighboring galaxies. "Our first sample shows what WISE is capable of. We can produce spectacular high-resolution images of the largest galaxies."

The new collage showcases galaxies of varying types -- everything from "grand design spirals," with their elegant cinnamon bun-like swirling arms, to so-called "flocculent" galaxies, which have a more patchy appearance. They are close enough to us that WISE can see details of their structure, for example their sinuous arms and central bulges. Because WISE can study so many types of nearby galaxies, its observations will provide a better understanding of how these complex objects form and evolve.

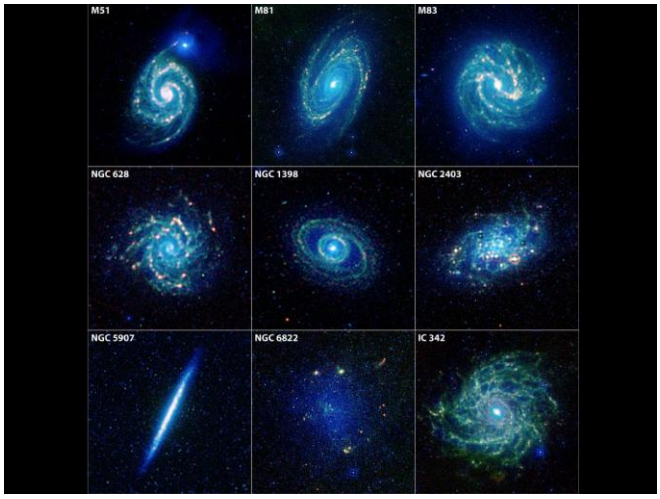
WISE, which launched into space in Dec. 2009, scanned the whole sky one-and-a-half times in infrared light. It captured images of asteroids in our own solar system, distant galaxies billions of light-years away, and everything in between. The mission's first batch of data, which does not include all of the galaxies in the new collage, was released to the public in April of this year. The complete WISE catalog will follow a year later, in the spring of 2012.

"We can learn about a galaxy's stars -- where are they forming and how fast?" said Jarrett. "There's so much diversity in galaxies to explore."

The new collection of nine galaxies shows off this diversity, with members of different sizes, colors and shapes. Infrared light from the galaxies, which we can't see with our eyes, has been translated into visible-light colors that we can see. Blue colors show older populations of stars, while yellow indicates dusty areas where stars are forming.

Some of the galaxies are oriented toward us nearly face-on, such as Messier 83, and others are partly angled away from us, for example Messier 81. One galaxy, NGC 5907, is oriented completely edge-on, so that all we can see is its profile. The edge of its main galaxy disk appears pencil-thin, and its halo of surrounding stars is barely visible as a green glow above and below the disk.

The arms of the galaxies come in different shapes too. Messier 51 has arms that look like a spiral lollipop, while the arms of the flocculent galaxy NGC 2403 look choppy, perhaps more like layered frosting. Astronomers think that gravitational interactions with companion galaxies may lead to more well-defined spiral arms. One such companion can be seen near Messier 51 in blue. Some of the galaxies also have spokes, or spurs, that join the arms together, such as those in IC 342.



A new, colorful collection of galaxy specimens has been released by NASA's Wide-field Infrared Survey Explorer, or WISE, mission. It showcases galaxies of several types, from elegant grand design spirals to more patchy flocculent spirals. Some of the galaxies have roundish centers, while others have elongated central bars. The orientation of the galaxies varies as well, with some seeming to peer straight back at us in the face-on configuration while others point to the side, appearing edge-on. Infrared light has been translated into colors we see with our eyes, such that the shortest wavelengths are blue and the longest are red. The oldest stars appear blue, while pockets of newly formed stars have yellow or reddish hues. Image credit: NASA/JPL-Caltech

JPL manages and operates the Wide-field Infrared Survey Explorer for NASA's Science Mission Directorate, Washington. The principal investigator, Edward Wright, is at UCLA. The mission was competitively selected under NASA's Explorers Program managed by the Goddard Space Flight Center, Greenbelt, Md. The science instrument was built by the Space Dynamics Laboratory, Logan, Utah, and the spacecraft was built by Ball Aerospace & Technologies Corp., Boulder, Colo. Science operations and data processing take place at the Infrared Processing and Analysis Center at the California Institute of Technology in Pasadena. Caltech manages JPL for NASA.

More information is online at http://www.nasa.gov/wise, http://wise.astro.ucla.edu and http://jpl.nasa.gov/wise.

Whitney Clavin
Jet Propulsion Laboratory, Pasadena, Calif.

June 2011 Celestial Events:

supplied by J. Randolph Walton (Randy)

Day	Date	Time (EDT)	Event
Sat	4	02:50	Saturn Sets
		03:25	Jupiter Rises
		04:10	Mars Rises
		04:32	Venus Rises
		05:00	Mercury Rises
		05:32	Sunrise
		20:25	Sunset
		22:51	Moon Set
Wed	8	12:33	Moon rise
Thu	9	13:43	Moon rise
		22:00	**Lunar Straight Wall visible**
Fri	10	05:25	**Double shadow transit on Jupiter**
Sat	11	02:25	Saturn Sets
		03:00	Jupiter Rises
		04:00	Mars Rises
		04:30	Venus Rises
		05:25	Mercury Rises
		05:31	Sunrise
		16:07	Moon rise
		20:29	Sunset
Wed	15	16:14	**Full Moon**
		19:00	**Total Lunar Eclipse Ends, not visible in NJ**
		20:30	Sunset
		20:35	Moon rise
Sat	18	01:55	Saturn Sets
		02:40	Jupiter Rises
		03:45	Mars Rises
		04:32	Venus Rises
		05:31	Sunrise
		20:31	Sunset
		21:10	Mercury Sets
		22:41	Moon rise
Tue	21	13:16	**Summer Solstice**
Thu	23	07:48	**Last Quarter Moon**
		13:24	Moon Set
Sat	25	01:27	Saturn Sets
		02:15	Jupiter Rises
		03:35	Mars Rises
		04:35	Venus Rises
		05:32	Sunrise
		15:20	Moon Set
		20:33	Sunset
		21:40	Mercury Sets
Sun	26	04:03	**Double shadow transit on Jupiter**
Fri	**July 1**	04:38	**Partial Solar Eclipse, not visible in NJ**
		04:54	**New Moon**

In the Eyepiece

Here is a list of objects for this month. This is reproduced from www.skyhound.com with the kind permission of its creator and author of SkyTools Greg Crinklaw.

Object(s)	Class	Con	RA	Dec	Mag
Mu Boo	Multiple Star System	Bootes	15h24m30.9s	+37°22'38"	4.3+7.2
M5	Globular Cluster	Ser	15h18m15.4s	+02°05'00"	5.7
NGC 5897	Globular Cluster	Libra	15h17m24.0s	-21°03'26"	8.4
NGC 6207	Galaxy	Hercules	16h43m03.9s	+36°49'58"	12.1
NGC 6144	Globular Cluster	Scorpius	16h27m14.0s	-26°01'18"	9
NGC 6210	Planetary Nebula	Hercules	16h44m29.5s	+23°47'59"	9.3
A 39	Planetary Nebula	Hercules	16h27m33.9s	+27°54'29"	13.7
The Rumpled Starfish (NGC 6240)	Interacting Galaxy	Ophiuchus	16h52m59.0s	+02°24'02"	13.8
Me 2-1	Planetary Nebula	Libra	15h22m18.6s	-23°37'35"	11.6
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Coordinates are epoch 2000.0